Parking Ordinance Impact Explorer

An integrated database and query agent that traces the basis of parking supply

Parking Ordinances × Building Permits × Parking Supply & Demand

Why is there nowhere to park in a city full of parking spaces?

IMEN891K / IDSC501 Data Engineering · Term Project Proposal · Damin Lee, Jeehee Ryu, Sohyeon Kim

Parking Shortage: What Is the Real Problem?

Everyone talks about a **parking shortage**, but **what exactly is wrong** is not clear

96%

Building parking · only for that building's users

4%

Public & private lots · open to all



1 Lots of building parking, yet no space

Users say there's nowhere to park

2 Cars with nowhere to go all head to the 4%

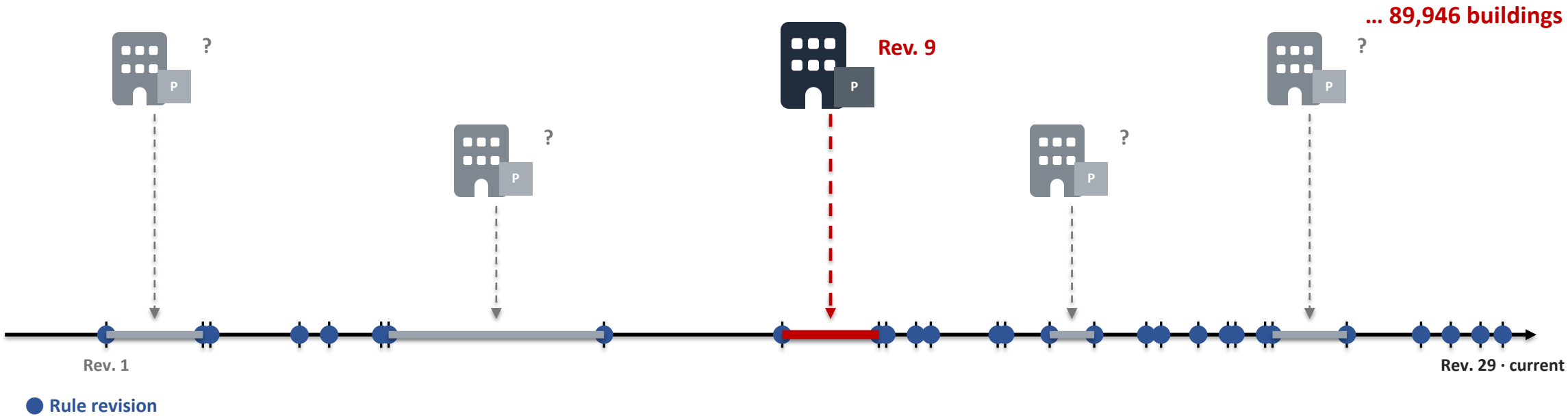
Visitors to places with no parking + cars pushed out of ①

Enough building parking? · Built more than the rule asks? · More public lots, or a new rule? → **No numbers to decide**

Parking mix: our calculation from Pohang public data (Aug 2026) · per 100 registered cars: 138 spaces = 132 in buildings + 6 in lots open to all · Icons: Font Awesome Free (CC BY 4.0)

Building Parking Rule

How many spaces each building needs is set by the **city rule** — and the rule **keeps changing**



Pieces of the rule Rule table · 13 notes · addenda · National rule (Annex 1) · Building register (permit date · area)

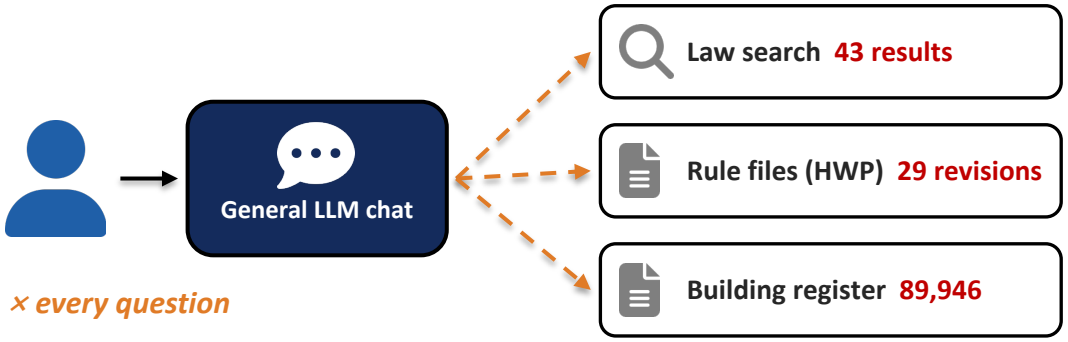
29 revisions × **89,946 buildings** → for each building, find **the version in force on its permit date**

Pohang Parking Ordinance: Annex 7 · 13 notes · 29 addenda (29 revisions; the parking table itself changed in 4) · Parking Act Enforcement Decree, Annex 1 · Building register: 89,946 records · Revision spacing, building positions and version numbers are illustrative · Icons: Font Awesome Free (CC BY 4.0)

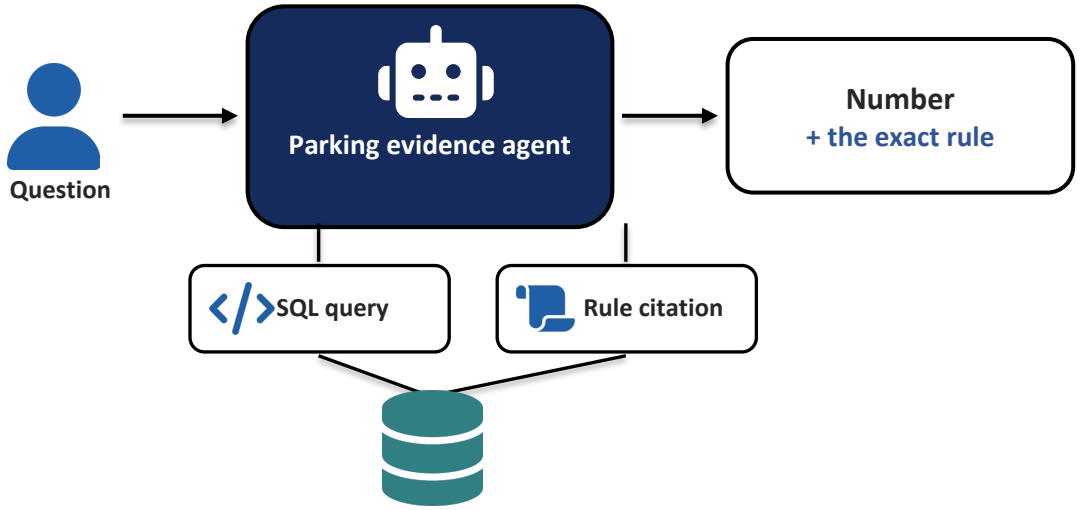
General LLM vs. Our Agent

A general LLM searches everything for every question; **our agent** takes it from the database

① Ask a general LLM to search for you



② An agent with an evidence database



😭 **Too much to read, every single time**

😄 **Reads only what it needs Exact evidence**

What We Build

An evidence DB and a web tool that show **how the rule shaped** Pohang's parking

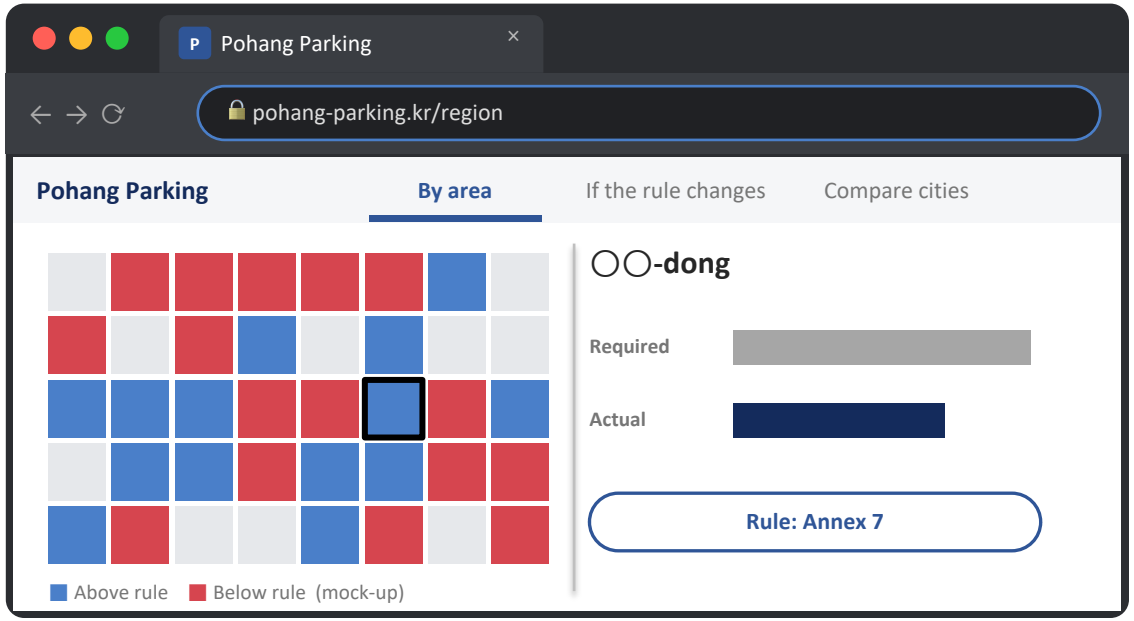
① Evidence DB

Building	Permit date	Version	Required	Actual
Bldg A (ex.)	2021-01-10	Feb 2020	3	3
1989 shop	1989-03-13	to restore	?	0 or none
⋮	⋮	⋮	⋮	⋮
86,987 bldgs				

Rule × permit date

For each building: how many it needed then, and how many it built

② Web tool

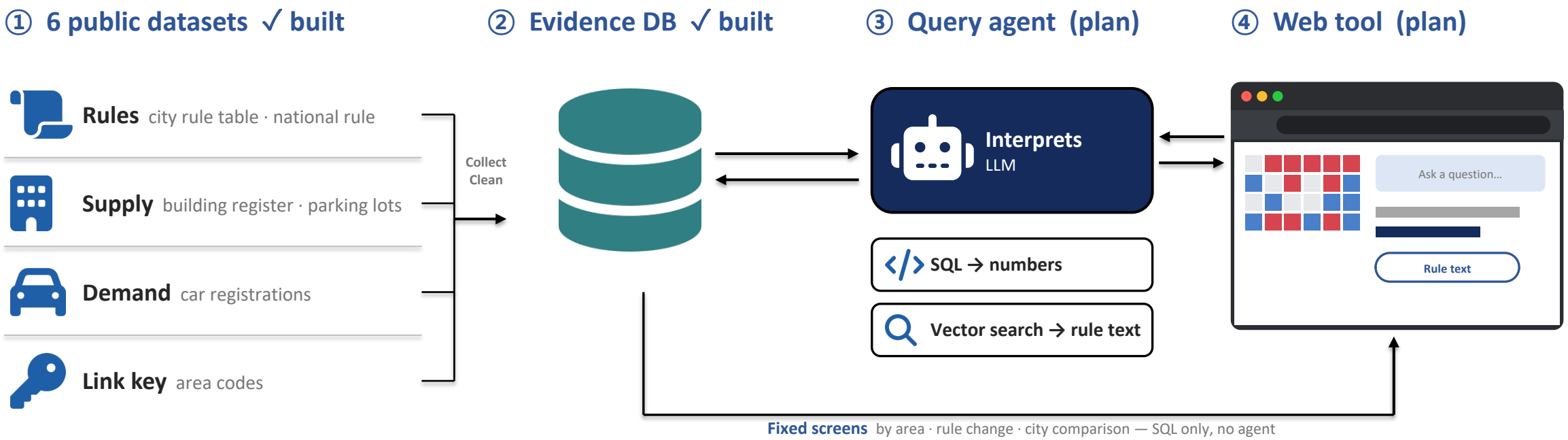


Every number comes with its rule

By area · effect of a rule change · city comparison

System Overview

The agent reads the question and takes **numbers and rule text** from the DB



"Do new shops build more parking than required?" → of 399 buildings, **60% have exactly the legal minimum** · Annex 7 · PoC, via SQL

Explore Data: 6 Public Datasets

For each building, **three questions** — the answers are **spread across 6 datasets**

How many spaces were required?

1 **City rule (Annex 7)** HWP
Pohang's rule
10 items

2 **National rule (Annex 1)** XML
National default · to compare
11 items

How many were built?

3 **Building register** JSON
89,946 records
All buildings (86,987 main) · each with a parking field

Parking & cars nearby?

4 **Public & private lots** CSV
Parking anyone can use
416 lots

5 **Car registrations** CSV
Parking demand
292,123 cars

6 **Area codes (254)** CSV — e.g. **"Pohang Buk-gu"** → **47113** gives ④⑤ the same area code as ③

Join the 6 → 1 building = 1 row (next: an example)

④ Pohang only, of 18,939 lots nationwide · ⑥ Pohang only, of 20,561 codes · ⑤ Pohang Nam-gu & Buk-gu, Aug 2026 · All from official APIs and files

Example: One Building → One Row

③ as it is, ①② by type + permit date, ④⑤ by area code

③ From the building register					①② By type + permit date		Calculated	④⑤ Found by area code	
Type	Permit date	Floor area*	Area code	Actual spaces	① Pohang rule	② National rule	= Required	④ Public spaces	⑤ Cars
Shop	2021.1.10	570 m²	47113	3	1 space per 200 m²	1 space per 200 m²	3	9,922	161,441
Copied from one raw API record (*floor area is calculated)					Type 1 shop + 2021 → **"Neighborhood commercial" row, Feb 2020 version**		**570 ÷ 200** = 2.85 → 3	⑥ "Pohang Buk-gu" → **47113** → summed by the same code	

Building A = 1 row × 86,987 buildings → web tool data (2,578 have a rule today)

Building A is an example · *Floor area = total floor area − indoor parking area · Public parking = 205 lots in Buk-gu · Cars: Aug 2026 · District level for now (lots can go to neighborhood level with coordinates; car data stays at district level)

Raw Data: As We Received It

Zeros, numbers and place names mean different things in each source — merge as-is and it's **wrong**

③ Building register
Building HUB API · JSON

```
"pmsDay": "19890313",
"indrAutoUtcnt": 0,
"oudrAutoUtcnt": 0
← No parking? Or not recorded?

"pmsDay": "1976"   ← year only
```

Is 0 "none" or "not recorded"? Can't tell

①② Rule tables
Law portal · HWP (city) / XML (national)

```
3. Type 1 neighborhood commercial
 ◦ 1 per 200 m² of floor area
← A sentence, not a table

Note 2. Parking area is excluded
  from the floor area
← Rule hidden in a note
```

Numbers in sentences → make a table

④⑤ Cars · place names
MOLIT statistics · CSV

```
Pohang Nam-gu,151,101,814,…
← 151 | 101,814 ? 151,101 | 814 ?

47111 building register
Pohang Nam-gu car statistics
← Same district, no match
```

Split numbers · place names don't match

Merge as-is and it's wrong → next: how we fixed each one

Building register: real API response from Sangdo-dong, Nam-gu (some fields) · Annex 7: Pohang Parking Ordinance (Feb 25, 2020), HWP text, translated · Cars: MOLIT statistics, Aug 2026, raw CSV line

Pre-processing: After Cleaning

The raw data from the last slide, **after cleaning** — raw kept, every fix **marked**

③ Building register cleaned

`"indrAutoUtcnt": 0, "oudrAutoUtcnt": 0`

↓

Parking	0 or no record

`"pmsDay": "1976"`

↓

Permit year	1976 · year only

①② Rule tables cleaned

◦ 1 space per 200 m² of floor area

↓

Use	m² per space	Start date
Shop	200	2020.2.25
Amusement	67	2020.2.25

⋮

✓ **Within 0.5–1.5× the national rule**

④⑤ Cars · place names cleaned

151,101,814,1,437,103,402

↓

Gov't		Private		Business		Total
151	+	101,814	+	1,437	=	103,402

✓ **Cut where the totals match**

"Pohang Nam-gu" · "Gyeongbuk Pohang Nam-gu …"

↓

47111

67,924 buildings
Kept, but left out of the comparison

22 rows
city + national · 0 out of range

279/279 rows
parking lots 416/416

Raw kept · every fix marked → check before vs. after in numbers

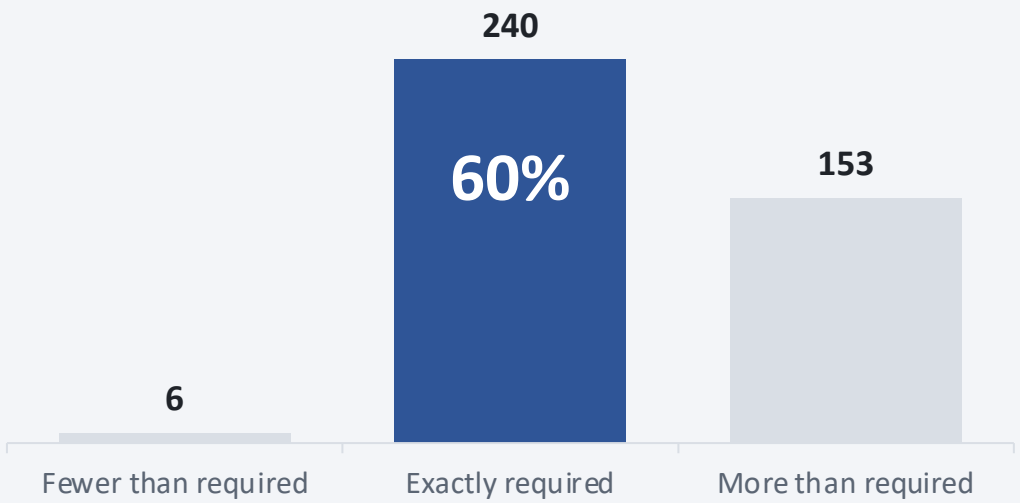
Raw data kept as-is in the raw schema · cleaned data in the clean schema · Zeros mix true zeros (small shops legally need 0) and missing records (97–99% of pre-1990 buildings show 0), so they can't be told apart

PoC: The Rule Sets the Supply

First check: **do new buildings build just the minimum?** → if so, **a new rule means new supply**

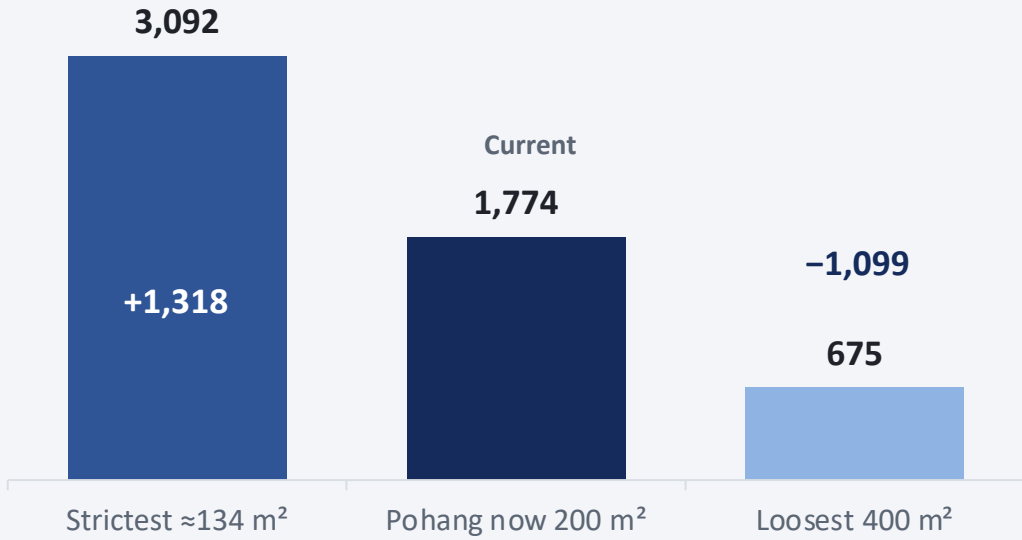
① How many did they build?

Neighborhood shops, 399 buildings · vs. the legal requirement



② The range a city rule can set

Within ±½ of the national rule · required spaces for the same 1,590 buildings



One number in the rule: 675 – 3,092 spaces → see the effect before a change, and check it after

Scope: shop buildings permitted after the Feb 25, 2020 revision · Left: 1,590 → 551 need ≥ 1 space → 399 with a parking record (152 with 0 left out) · Right: all 1,590 · Basis: Parking Act Enforcement Decree, Art. 6(2) · 134 m² = Seoul's value (legal limit ≈ 133 m²)

Plan: Now → In 8 Weeks

Fix the PoC's limits one by one → evidence DB + web tool + agent

	Now (PoC limits)		In 8 weeks (how)
Rule versions	Only 2020 → 2,578 buildings (all uses)	→	**All past versions of Annex 7 (law portal history)**
Required spaces	Main use only (approx.)	→	**Area by use, floor by floor (floor data API)**
0 or no record	78% grouped, only marked	→	**Split by decade & use, then correct**
Other cities	Pohang only	→	**LLM extraction · accuracy tested on Pohang first**
Area · access	District · SQL	→	**Neighborhood (lots) · web tool + agent**

Weeks 1–2	Weeks 3–4	Weeks 5–6	Weeks 7–8
Restore past versions	**Extract other cities**	**Correct · neighborhood**	**Web · agent · evaluation**

Final output → evidence DB + web tool (query agent) + evaluation report

If stuck: if we can't get past rule tables, compare cities at the same point in time · Roles — Industrial Eng.: metrics, analysis | CS (data): collection, DB, web | CS (LLM): rule extraction, agent